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Materials and Environmental Investigations

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Test Report

Properties of Covertex Spray-On Paving

Prepared for:

Decorative Technologies Group Pty Ltd

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Job Number: 1185

Report Number: C9910

November 2002

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Report No. C9910

Issued by



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Date 15/11/02

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TEST REPORTS

1. SCOPE

Covertex Spray-On Paving was applied to cured panels of concrete (40 MPa design) and cured for 7 days under standard conditions.

Tests were then carried out using the following procedures:-

Wet Pendulum Test, to Appendix A of AS/NZS 4586:1999

Dry Floor Friction Test, to Appendix B of AS/NZS 4586:1999

Abrasion Resistance to AS/NZS 4456.9:1997

Elcometer Pull-Off Adhesion.

Mortar cubes (nominally 75 mm) were also cast from the Covertex texture coating material, for determination of **Unconfined Compressive Strength** at 7, 14 and 28 days, in accordance with the procedure of AS 1012.9.

2. PREPARATION OF TEST SAMPLES

2.1 Preparation of Concrete Substrate

A batch of 8 concrete panels, 450 x 300 mm and 45 mm thick were cast in form-ply moulds, using concrete made in a 100 litre Bennett Pan Mixer, using the concrete mix design shown in Table 1. These slabs were cast on 16/09/02.

Table 1 Concrete Mix Design for Test Substrate Panels

Ingredient	kg	kg
GP cement	33.0	440
20 mm crushed Basalt	34.8	464
10 mm crushed Basalt	48.0	640
Coarse sand	23.0	305
Fine sand	35.0	470
Water	13.2	176
Daratard	90 ml	1.2 Litre
TOTAL	75 Litres	1 Cubic Metre

The concrete characteristics were as follows:-

- Water-cement Ratio = 0.4
- Slump spec = 80
- Density spec = 2400

100 mm diameter cylinders (2 off) were cast and tested in accordance with AS 1012.9 at 28 days to determine the unconfined compressive strength of the concrete. The average result was 52.5 MPa (see attached NATA certificate No. 29504, issued by Testrite).

The slabs were cured for 28 days, and were then acid etched with a 25% mixture of muriatic acid in water to produce a surface profile similar to coarse sand-paper. The slabs were then allowed to air-dry for 48 hours before proceeding.

2.2 Covertex Application

The DT Covertex system was applied to the eight slabs by Scott Macallister and Frank Knippers of Decorative Technologies at CTI on 16th October 2002.

The application sequence was an initial spraying onto each block of Covertex primer, prepared as a mix of clean water and Covertex Modifier (batch number #686).

Once dry, a layer of Covertex basecoat (batch number #02.10.1015) coloured with "Bone" dispersant (batch number #0112/003) was spread over the blocks.

After several minutes, the basecoat was dry, and two hopper-gun sprayings of Covertex texture top coat were applied. The top coat was coloured with "Light Terracotta" dispersant (batch number #0207/043).

Two rectangular steel moulds were filled with this top coat mix to provide cubes for unconfined compressive strength determination after appropriate curing.

The coated blocks were allowed to set under ambient conditions.

Within 24 hours, one coat of DT Covertex Sealer was applied by roller and allowed to dry. A second sealing coat was similarly applied after a further 24 hours curing.

The blocks were then ambient cured for seven days before being cut into various sized test pieces.

2.3 Details of Test Specimens

Four of the full size panels were submitted to Boral Research for Dry Floor Friction testing, and the other four panels were cut into 24 paver sized (220 x 100 mm) sub-samples. Five of the pavers were submitted to Boral Research for Wet Pendulum Testing and 18 were submitted to Boral Research for Abrasion Testing

One paver was retained for Elcometer Pull-Off Adhesion testing by CTI.

3. TEST METHODS AND RESULTS

3.1 Wet Pendulum Test

The Mean British Pendulum Number for the five test samples was 52. This allows the product to be classified in accordance with Table 2 of AS/NZS 4586 as Class 'W' –low risk of slipping when surface wet. The test certificate from Boral is attached.

The Clay Brick and Paver Institute has issued guidelines for clay pavers which state that for any pedestrian use, regardless of the volume of traffic, the mean pendulum test result should be greater than 44. Therefore the Covertex complies with this requirement.

3.2 Dry Floor Friction Values

The Mean Co-efficient of Friction for two test runs was 1.28. This allows the product to be classified in accordance with Tables 1 and 3 of AS/NZS 4586 as Class 'F' – (floor friction tester mean value > 0.4). The test certificate from Boral is attached.

3.3 Abrasion Testing

The Mean Abrasion Index for the set of 16 samples was 0.95, with an unbiased standard deviation of 0.29. The test certificate from Boral is attached.

The Clay Brick and Paver Institute has issued guidelines for clay pavers which state that an abrasion index of less than 3.5 is regarded as suitable for inner-city and major suburban pedestrian malls and paths, and for pavements with high-volume pedestrian traffic (over 30,000 passes per day) that include about one third with high-heeled shoes. Covertex has an abrasion index of 0.95 and therefore complies with this requirement.

An abrasion index of up to 5.5 is regarded as suitable for suburban shopping area pavements, pedestrian areas around institutional buildings, sporting or recreational areas. An abrasion index greater than 5.5 would render a product suitable for paths in public gardens, pavements at schools or campuses, hard landscape areas and common areas of residential buildings.

The Clay Brick and Paver Institute do not regard road surfaces as being abrasive environments and therefore do not apply abrasion criteria to these uses.

3.4 Adhesion

The adhesion testing was carried out using an Elcometer Model 106-3 Pull-Off tester complying with AS 1580.408.5 (which is similar to ASTM D1002).

Aluminium dollies were fixed to the hardened Covertex topping using an epoxy glue. After 14 days and after 28 days curing of the Covertex under ambient conditions, the dollies were removed using the Pull-Off tester. The force required to remove the dollies converted to the strength in MPa, and the nature of the failure were recorded for each test.

The results are presented in Table 2 below.

Table 2 Adhesion Results

Age at Test	Pull-off Strength	Failure mode
14 days	1.3 MPa (Average of 3)	100% Cohesive within Covertex
28 days	2.0 MPa (Average of 4) 2.2 MPa (Highest value)	60% cohesive within Covertex, 40% adhesive primer from concrete (some variation over panel)

The result showed that the adhesion of the topping to the concrete is greater than 2.2 MPa. In all cases, failure occurred within the topping, showing the adhesion to be greater than the cohesive strength of the material.

3.5 Compressive Strength

The 75 mm cubes were submitted to Testrite Laboratories for testing for compressive strength to AS 1012, after air drying at standard conditions for the stated period.

The results (see Testrite Certificate No. 24467 attached) were **29.5 MPa after 7 days, 38 MPa after 14 days and 40.5 MPa after 28 days.**

The average density was **1920 kg/m³.**

APPENDIX A

TEST REPORTS

Report By	Report No.	Report Description
Boral Resources	3640	Abrasion Resistance
Boral Resources	3640	Wet Pendulum Test
Boral Resources	3640	Dry Friction Test
Testrite	29504	Compressive Strength of concrete test panels
Testrite	30082	Compressive Strength of Covertex (7, 14 & 28 days)



MATERIALS TECHNICAL SERVICES
BORAL RESOURCES (NSW) PTY LTD
 ABN 51 000 756 507
 Unit 4, 3-5 Gibben Road
 Baulkham Hills NSW 2153 Australia
 PO Box 400, Winston Hills NSW 2153
 Telephone 61 2 9624 9900
 Facsimile 61 2 9624 9989

FILE NO: 169/02
 DATE RECEIVED: 23.10.02
 AGE OF SPECIMEN: Unknown
 LAB SAMPLE NO: 36191

CLIENT: CTI Consultants Pty. Ltd.
 PROJECT: Quality Control
 PLANT: Unknown
 DATE TESTED: 28.10.02
 TEST PROCEDURE: Determining Abrasion Resistance (Aust/NZ Standard 4456.9.97)
 SAMPLE DESCRIPTION: Covertex Paving Blocks
 LOCATION OF SAMPLING: Unknown
 DESCRIPTION OF TEXTURE OF THE WEARING SURFACE TESTED: Rough
 CLIENT SAMPLE NO: CTI20858-20875

Specimen No:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Abrasion Index:	1.24	1.51	0.75	0.67	1.06	0.93	1.02	1.14	0.88	1.02	0.48	1.01	0.75	0.80	0.53	1.45
Mean Abrasion Index for the sample:	0.95															
Unbiased Standard Deviation for the Sample:	0.29															

Sample submitted by client.
 D. Stitt, File, Ref: 3640.Rep

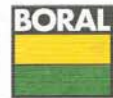
Authorised Signatory: 
 Date: 30.10.02 Serial No. 32564
 Richard Bawer

NATA Accredited Laboratory
 Number: 547

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MATERIALS TECHNICAL SERVICES
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 ABN 51 000 756 507
 Unit 4, 3-5 Gibbon Road
 Baulkham Hills NSW 2153 Australia
 PO Box 400, Winston Hills NSW 2153
 Telephone 61 2 9624 9900
 Facsimile 61 2 9624 9999

Test Report

CLIENT: CTI Consultants Pty. Ltd.
 PROJECT: Quality Control
 SAMPLE DESCRIPTION: Covertex Paver
 DATE RECEIVED: 23.10.02
 DATE OF TEST: 24.10.02
 ENVIRONMENTAL CONDITIONS: Air-conditioned room
 TYPE OF RUBBER USED: 4S
 TEST CONDUCTED: In Laboratory
 TYPE OF TEST: Unfixed surface
 AIR TEMPERATURE AT TIME OF TEST: 23°C

FILE NO: 169/02


TEST PROCEDURE: AS/NZS 4586:1999 Appendix A – Wet Pendulum Test Method

Client Sample No: CTI20876-20880
 Laboratory Sample No: 36192

TEST METHOD	TEST	RESULT	
AS/NZS: 4586, App. A	Wet Pendulum Test		
	The Mean British Pendulum Number For Each Test Specimen:		
		1	50
		2	52
		3	53
		4	48
	5	57	
	The Mean British Pendulum Number For the Sample:	52	

Classification achieved in accordance with AS/NZS.4586, Table 2. Class 'W' – low risk of slipping when surface wet.
 Sample submitted by client.

D. Stitt, File, Ref: 3640.Rep

Authorised Signatory 
 Date 20.10.02 Serial No. 32565

Richard Bawer



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MATERIALS TECHNICAL SERVICES
 BORAL RESOURCES (NSW) PTY LTD
 ABN 51 000 756 507
 Unit 4, 3-5 Gibbon Road
 Baulkham Hills NSW 2153 Australia
 PO Box 400, Winston Hills NSW 2153
 Telephone 61 2 9624 9900
 Facsimile 61 2 9624 9999

CLIENT: CTI Consultants Pty. Ltd.

FILE NO: 169/02

PROJECT: Quality Control

SAMPLE DESCRIPTION: Covertex Paving Blocks

DATE RECEIVED: 23.10.02

DATE OF TEST: 28.10.02

AIR TEMPERATURE AT THE TIME OF TEST: 23°C

ENVIRONMENTAL CONDITIONS: Air-conditioned room

TEST CONDUCTED: In laboratory

TYPE OF TEST: Unfixed Surface

TEST PROCEDURE: AS/NZS 4586:1999 Appendix B – Dry Friction Test Method

CLIENT SAMPLE NO:

CTI20881-CTI20884


LABORATORY SAMPLE NO:

36193

TEST METHOD	TEST	RESULT
AS/NZS 4586 App. B Appendix "B"	Dry Floor Friction Test	
	No. of test (runs) – one direction: The average value for each run:	Run No. 1 = 1.28 Run No. 2 = 1.28
	Mean coefficient of Friction for The sample:	1.28

Classification achieved in accordance with AS/NZS: 4586, Table 1 and 3. 'F', Floor Friction tester mean value >0.4.

Sample submitted by client.


RICHARD BAWER
SENIOR TECHNICAL OFFICER
 30TH OCTOBER 2002
 D. STITT, FILE, REF: 3640.REP

Testrite Coring Pty. Ltd. ABN 16001124830
 Ph: 9736 3922 Fax: 9743 5860

T E S T R I T E

4 Rothwell Ave. (P.O. Box 329)
 CONCORD WEST NSW 2138

**REPORT ON COMPRESSIVE STRENGTH OF
 CONCRETE CYLINDERS CAST BY OTHERS**

Job No.: **29504**
 Date Received: **17/09/02**

CLIENT: **C.T.I. Consultants Pty. Ltd.**
 ADDRESS: **P.O. Box 153**
NORTH STRATHFIELD NSW 2137
 PROJECT: **O/No.2215.**

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LOCATION	STRENGTH GRADE	DATE CAST	SPECIMEN IDENTIFICATION	AVERAGE DIAMETER x HEIGHT	DATE OF TEST	UNIT WEIGHT (kg/m ³)	AGE AT TEST	COMPRESSIVE STRENGTH (MPa)	REMARKS
16-09-2002		16-09-02	20649	100.2x199	14/10/02	2380	28	53.0	
			20650	100.4x200	14/10/02	2380	28	52.5	

The following notes apply unless stated otherwise herein:

- 1) Compressive strength determined as per A.S. 1012.9
- 2) Specimen Dimensions were 'Standard' as per A.S. 1012.9
- 3) Filled sulphur mixture was used to cap specimens
- 4) Standard cylinder, nominal diameter 100 mm

**THIS DOCUMENT MAY NOT BE
 REPRODUCED EXCEPT IN FULL.**

SIGNED: 
 NAME: **D. Carson**
 Approved Signatory
 DATE: **18-10-02**

Testrite Coring Pty. Ltd. ABN 16001124830
 Ph: 9736 3922 Fax: 9743 5860

T E S T R I T E

4 Rothwell Ave. (P.O. Box 329)
 CONCORD WEST NSW 2138

**REPORT ON COMPRESSIVE STRENGTH
 OF GROUT CUBES**

Job No.: **30082**
 Date Received: **22/10/02**

CLIENT: **C.T.I. Consultants Pty. Ltd.**
 ADDRESS: **P.O. Box 153**
NORTH STRATHFIELD NSW 2137
 PROJECT: **Job No.1185 - O/No.2236**

LOCATION	STRENGTH GRADE	SPECIMEN IDENTIFICATION	DATE OF TEST	WIDTH.1 (mm)	WIDTH.2 (mm)	AGE AT TEST	COMPRESSIVE STRENGTH (MPa)	REMARKS
Samples 20850-20855 Cast 16-10-2002			23/10/02	74.6	76.0	7	29.5	
			23/10/02	74.2	76.0	7	29.5	
			30/10/02	75.0	75.3	14	38.0	
			30/10/02	75.5	75.0	14	38.0	
			13/11/02	74.9	74.3	28	41.5	
			13/11/02	75.5	75.6	28	39.5	

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 REPRODUCED EXCEPT IN FULL.

SIGNED: 
 NAME: **J. Hewling**
 DATE: **15-11-02**